OSIsoft® UC 2010

Real Time Information — Currency of the New Decade

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Proactive Dashboards: The Power to Generate Knowledge

Presented by:

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April 28th, 2010

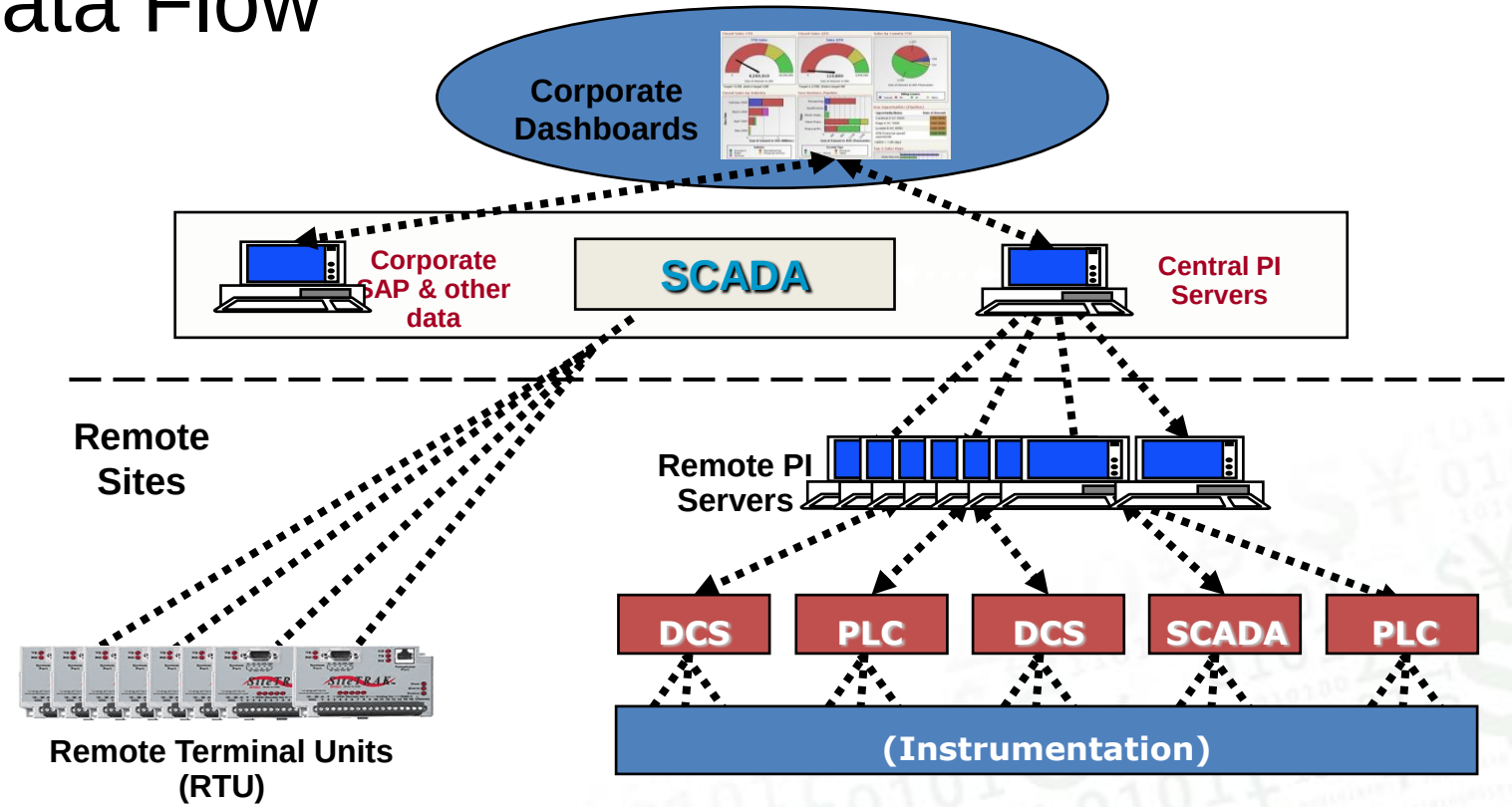
Saudi Arabian Oil Company (Saudi Aramco)

- Fully integrated global petroleum enterprise of Saudi Arabia (exploration, production, refining, marketing, & Int shipping)
- Leads the word in crude oil production and export
- Responsible for about 1/4 of the worlds proven oil reserves
- Four refineries, ten gas and NGL plants, and three local joint ventures
- Number of joint ventures around the word in oil & gas refining & petrochemical businesses (USA, China, Japan)
- Headquarters in Dhahran – Saudi Arabia
- 54,000 employees (2 of 7 in training)

OSIsoft at Saudi Aramco

- Largest user of PI and OSIsoft products in the Middle East
- First agreement was signed in 1996
- Approximately 105 PI servers
- Utilizing about 1.7 million PI tags.
- 2500+ of PI clients
  - PI-ProcessBook
  - PI-DataLink
  - PI-WebParts

Data Flow




Saudi Aramco PI Sites
Kuwait
Arabian Gulf
Doha
Riyadh
The Red Sea
Jeddah

Outline

- Objective
- Performance monitoring
- The need for good indicators
- Predicting failure proactively
- Proactive solution requirements
- Implementing the concept (Example)
- Solution architecture
- The way forward
- Summary of benefits

Objective

To:

Explain the concept of dual proactive performance monitoring

Show the implementation of proactive dashboards with the OSIsoft suite of applications

Performance Monitoring

"Difficult and boring …

my favorite combination!"

Fraiser TV series

The need for good indicators

- Understand exactly what is going on
- Know how well we are doing
- Analyze the past (what happened)
- Provide feedback on current operation
- Support preparing actions/modifications in response to changes
- Learn of potential problems that might need early actions to be avoided

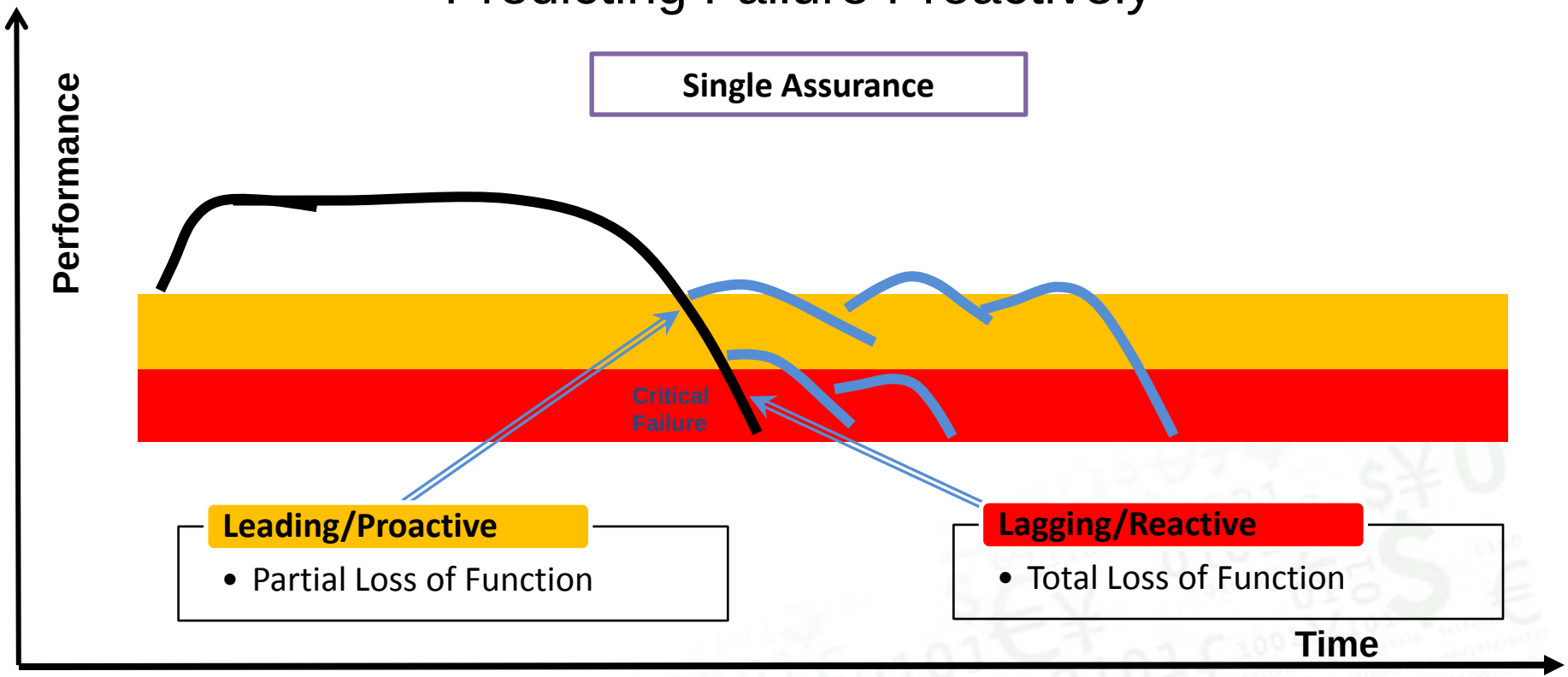
You need to avoid

- Measuring against yourself
- Depending on historical data (can you drive depending on your rare mirror only?)
- Putting high weight in numbers
- Gaming your indicators
- Static indicators (sticking too long to the same measures)

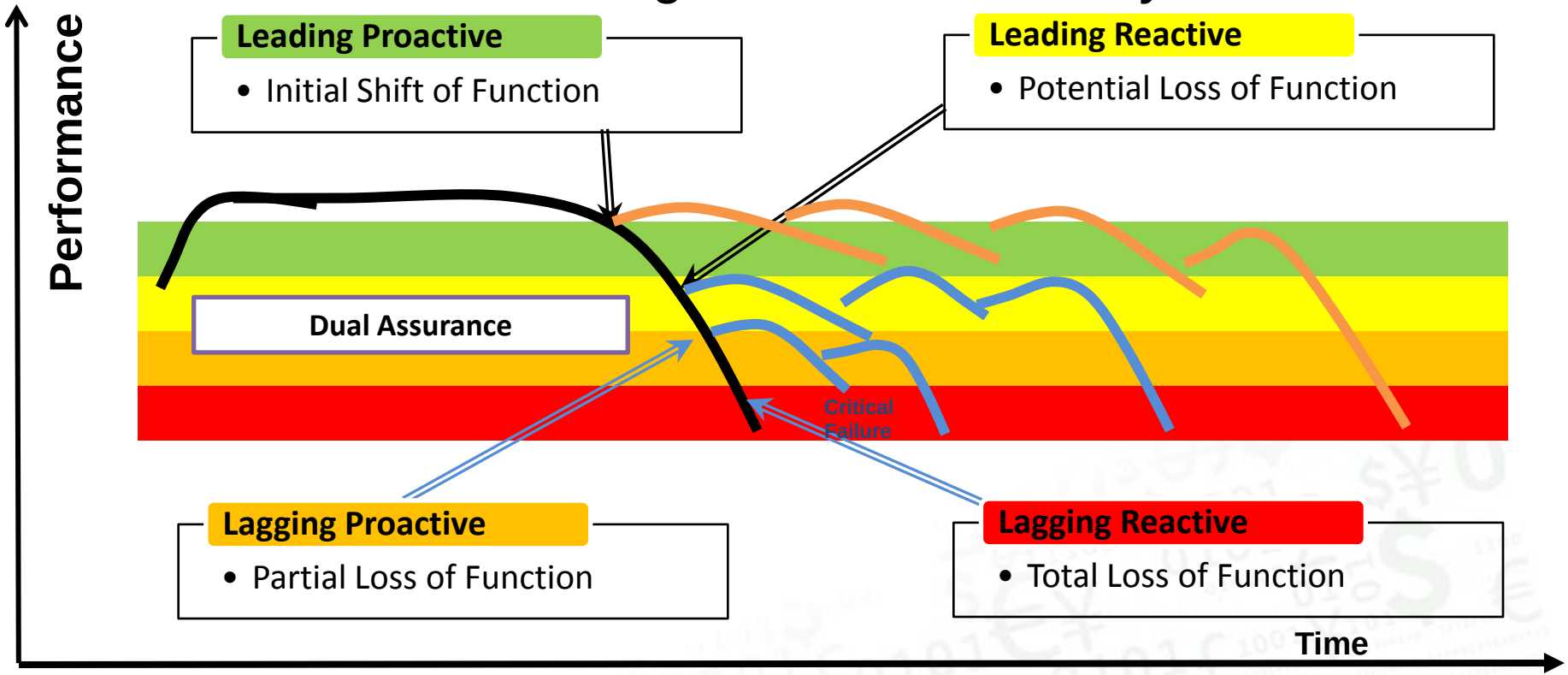
Key Indicators must be

- Meaningful
- Contextual
- Relevant to business
- Dynamic
- Capture multi levels (envelopes with different margins)
- Proactive

Predicting Failure Proactively



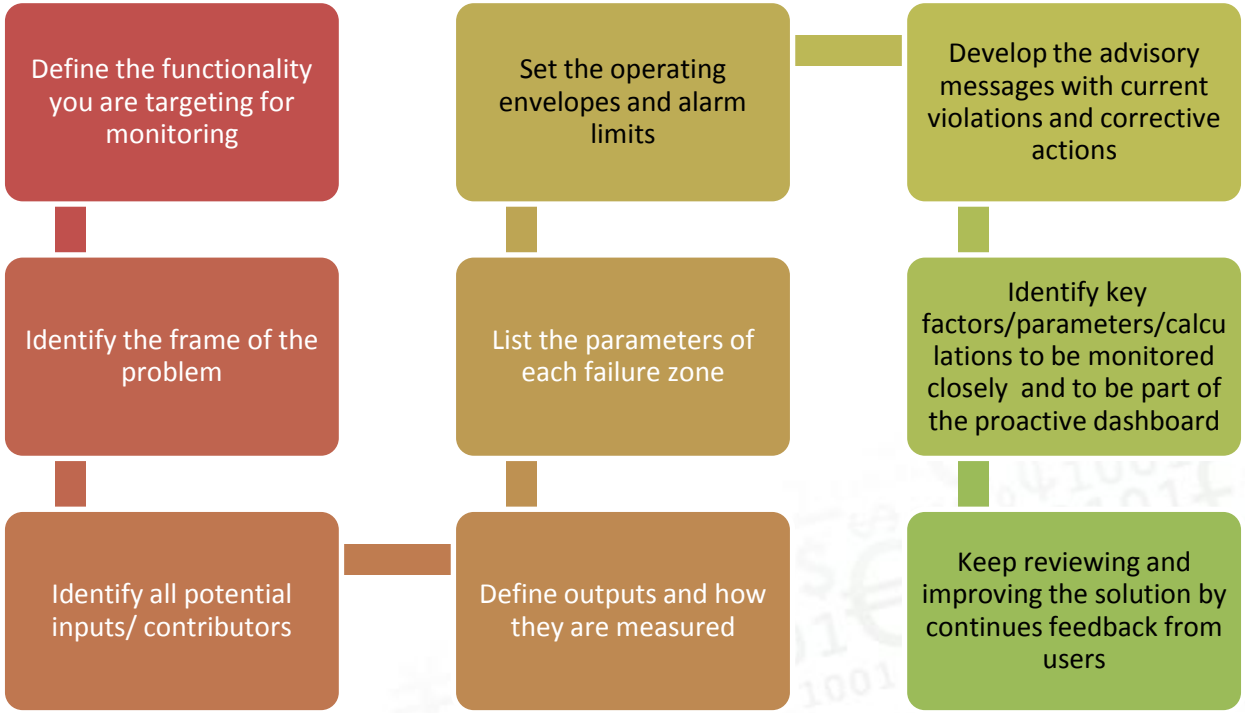
Predicting Failure Proactively



Proactive System Requirements

- Easy to measure and collect (Objective)
- Relevant to the function
- Provide current and reliable KPIs
- Cost efficient to be implemented
- Owned and understood (logic & reasons) by the users group
- Provide the connection between information and outcomes
- Provide information that can guide future actions

How to Transfer the Concept?

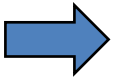


Example

Mercury Monitoring & Analyses

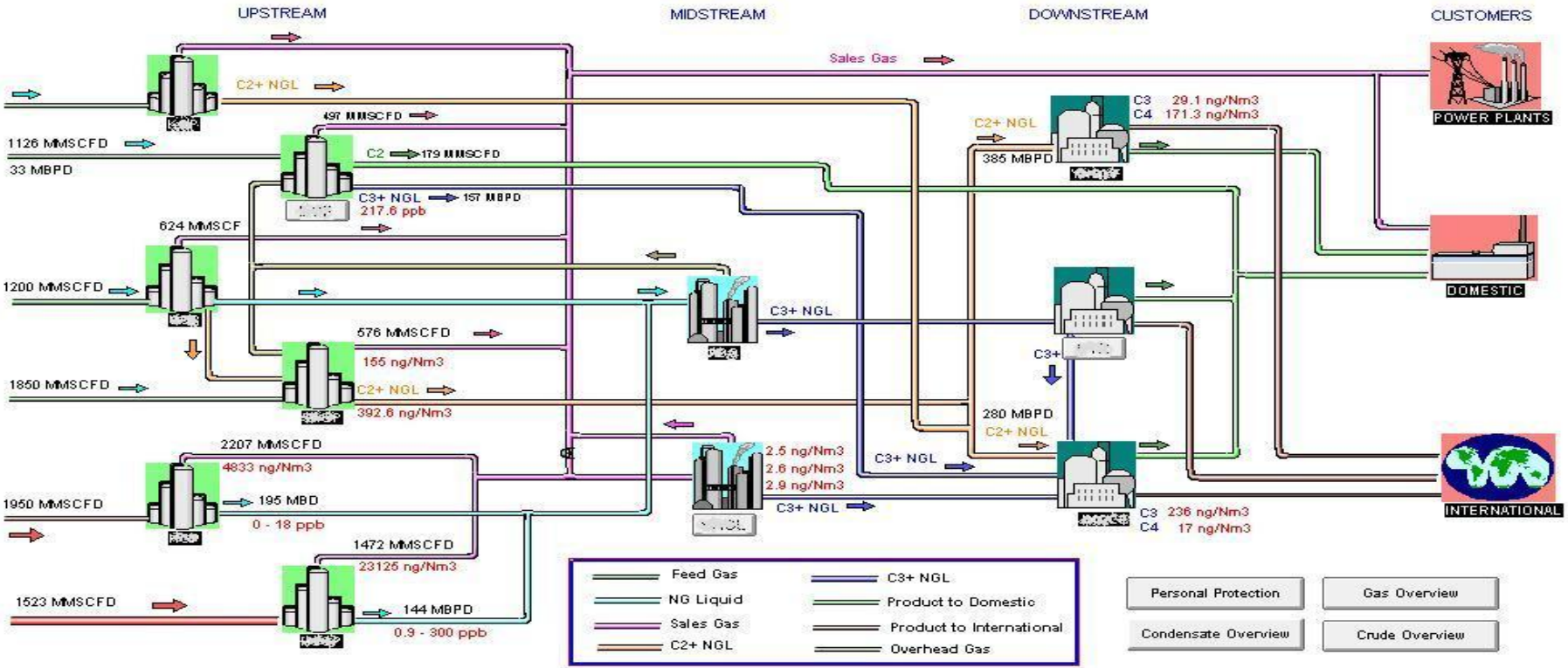
The Problem

- A number of mercury removal units scattered over the operating facilities
- The impact of each unit to the system is not fully monitored
- Final products selling prices are highly sensitive to the mercury level

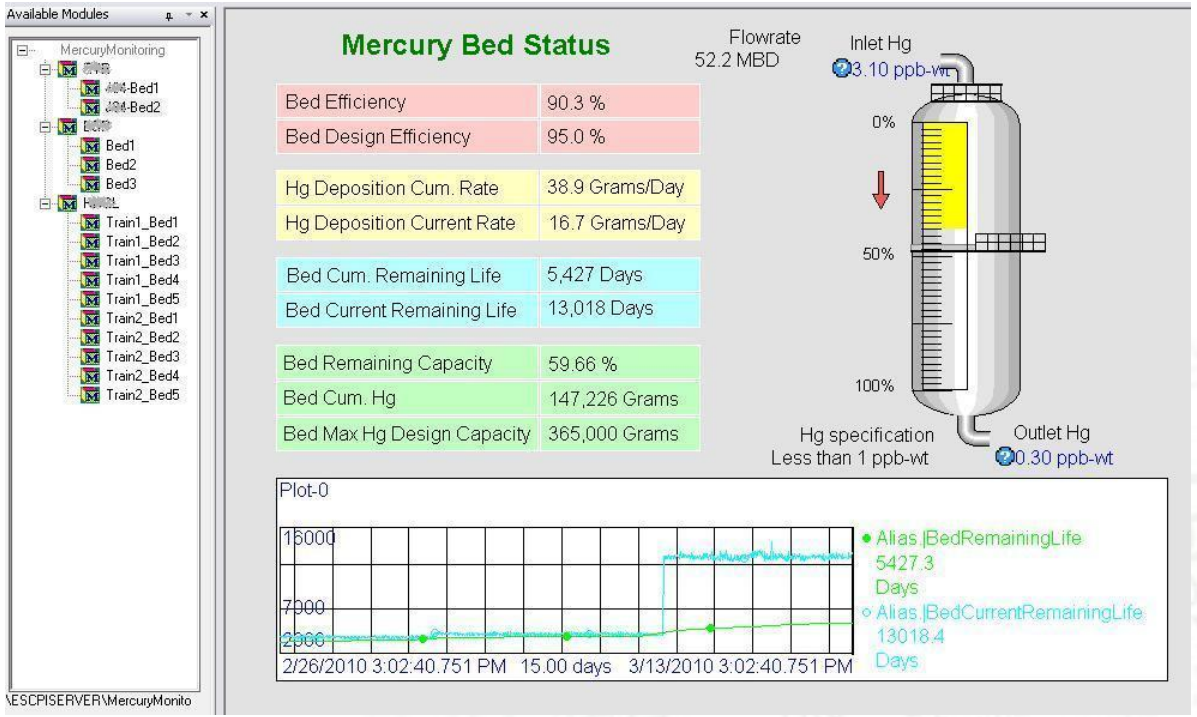


We need a proactive solution to monitor and improve performance

Overview Monitoring



Detailed Monitoring



Predictive Model Implementation

MRU Bed Analysis						
Leading Proactive (Initial Shift of Function)						
Tag	**Description**	**Value**	**Min**	**Max**	**Eng Unit**	**Design**
4TI005.PV	Temp	124.00	85	180	DEGF	140
4FI1054.PV	Bed-A Flowrate	52.27	16.5	60.0	MBD	55.0
IFI1055.PV	Bed-B Flowrate	51.97	16.5	60.0	MBD	55.0
0PDI172.PV	Mercury Inlet	3.80	0.0	20.0	ppb	100
Lab data	Saybolt Color		20	30	Saybolt	15
Lab data	Water Content		0.00	0.05	Volume %	0.05
Lab data	Particulates		0	15	Microns	10
Leading Reactive (Latent Loss of Function)						
Tag	**Description**	**Value**	**Min**	**Max**	**Eng Unit**	**Design**
4_MRU_Bed1_LHSV	Bed-A Current Liquid Hourly Space Velocity	18.81	12.0	22.0	RV/H	19.8
4_MRU_Bed2_LHSV	Bed-B Current Liquid Hourly Space Velocity	18.70	12.0	22.0	RV/H	19.8
4PDI1286.PV	Bed-B Delta-P	2.87	0.0	3.0	PSIG	10.0
No tag	Bed-A Delta-P		0.0	3.0	PSIG	10.0
Calculated	Change in Bed1 Current life over Average Life		12.0	25.0	%	
Calculated	Change in Bed2 Current life over Average Life		12.0	25.0	%	
4LBD493AOULHTN.L1	TOT Hg Bed1 Outlet ppb-wt	0.10	0.0	0.75	ppb	Less than 1
LBD493BOULHTN.L1	TOT Hg Bed2 Outlet ppb-wt	0.50	0.0	0.75	ppb	Less than 1
Lagging Proactive (Partial Loss of Function)						
Tag	**Description**	**Value**	**Min**	**Max**	**Eng Unit**	**Design**
4PDI1286.PV	Bed-B Delta-P	2.87	3.0	8.0	PSIG	10.0
No tag	Bed-A Delta-P		3.0	8.0	PSIG	10.0
4LBD493AOULHTN.L1	TOT Hg Bed1 Outlet ppb-wt	0.10	0.75	0.9	ppb	Less than 1
4LBD493BOULHTN.L1	TOT Hg Bed2 Outlet ppb-wt	0.50	0.75	0.9	ppb	Less than 1
Lagging Reactive (Total Loss of Function)						
Tag	**Description**	**Value**	**Min**	**Max**	**Eng Unit**	**Design**
4PDI1286.PV	Bed-B Delta-P	2.87	8.0	10.0	PSIG	10.0
No tag	Bed-A Delta-P		8.0	10.0	PSIG	10.0
4LBD493AOULHTN.L1	TOT Hg Bed1 Outlet ppb-wt	0.10	0.9	5.0	ppb	Less than 1
4LBD493BOULHTN.L1	TOT Hg Bed2 Outlet ppb-wt	0.50	0.9	5.0	ppb	Less than 1

The Dashboard

Engineering Sharepoint Portal

Welcome Hafiz, Rayan H | My Links | |

RTR MRU

This Site: RTR MRU

Home | BDP | PIW | JXK | Flare Minimization Plan | RTR_488_demo | RTR_J8 | DHT | JGP Sulfur Monitoring | MEROX | Site Actions

View All Site Content

Documents
- Shared Documents

Lists
- Calendar
- Tasks
- http://home.aramco.com.sa

Discussions
- Team Discussion

Sites

People and Groups

Recycle Bin

Engineering Sharepoint Portal > Mercury

Mercury Removal Unit

Advisory Messages

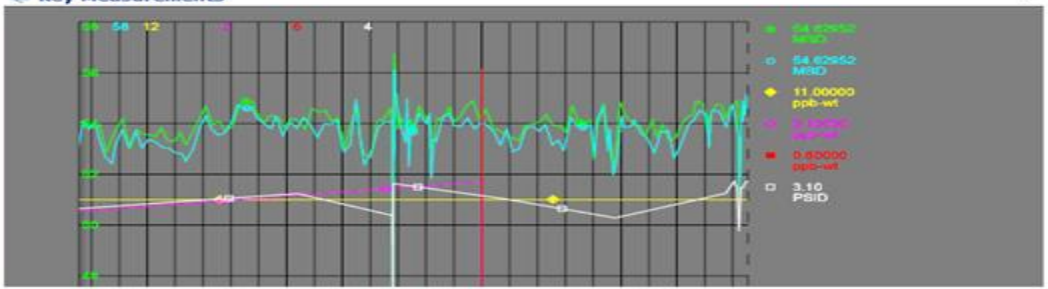
Value	Time
Bed pressure drop shows high value	4/12/2010 10:05:00 AM
Consider installing Filters. Filter change may be required	4/12/2010 10:05:00 AM
Check particulate size. Check corrosion rates and changes	4/12/2010 10:05:00 AM
IF no action: Beds will have to be bypassed or Beds may get plugged	4/12/2010 10:05:00 AM
	4/12/2010 10:05:00 AM

Proactive KPIs Table

[redacted] MRU Bad Analysis

Tag	Description	Value	Min	Max	Eng Unit	Design
Leading Proactive (Initial Shift of Function)						
[redacted]	Temp	139.75	80	160	DEGF	140
[redacted]	Bed-A Flowrate	54.63	16.5	60.0	MBD	55.0
[redacted]	Bed-B Flowrate	54.63	16.5	60.0	MBD	55.0
[redacted]	Mercury Inlet	11.00	0.0	20.0	ppb	100
Lab data	Baybolt Color		20	30	Baybolt	15
Lab data	Water Content		0.00	0.05	Volume %	0.05
Lab data	Particulates		0	15	Microns	10
Leading Reactive (Latent Loss of Function)						
[redacted]	Bed-A Current Liquid Hourly Space Velocity	19.66	12.0	22.0	#v/H	19.6
[redacted]	Bed-B Current Liquid Hourly Space Velocity	19.66	12.0	22.0	#v/H	19.6
[redacted]	Bed-B Delta-P	3.10	0.0	3.0	PSID	10.0
No tag	Bed-A Delta-P		0.0	3.0	PSID	10.0
Calculated	Change in Bed1 Current life over Average Life	41.40	12.0	25.0	%	
Calculated	Change in Bed2 Current life over Average Life	38.27	12.0	25.0	%	
[redacted]	TOT Hg Bed1 Outlet ppb-wt	0.10	0.0	0.75	ppb	Less than 1
[redacted]	TOT Hg Bed2 Outlet ppb-wt	0.60	0.0	0.75	ppb	Less than 1
Lagging Proactive (Partial Loss of Function)						
Tag	Description	Value	Min	Max	Eng Unit	Design
[redacted]	Bed-B Delta-P	3.10	3.0	8.0	PSID	10.0
No tag	Bed-A Delta-P		3.0	8.0	PSID	10.0
[redacted]	TOT Hg Bed1 Outlet ppb-wt	0.10	0.75	0.9	ppb	Less than 1
[redacted]	TOT Hg Bed2 Outlet ppb-wt	0.60	0.75	0.9	ppb	Less than 1
Lagging Reactive (Total Loss of Function)						
Tag	Description	Value	Min	Max	Eng Unit	Design
[redacted]	Bed-B Delta-P	3.10	8.0	10.0	PSID	10.0
No tag	Bed-A Delta-P		8.0	10.0	PSID	10.0
[redacted]	TOT Hg Bed1 Outlet ppb-wt	0.10	0.9	5.0	ppb	Less than 1
[redacted]	TOT Hg Bed2 Outlet ppb-wt	0.60	0.9	5.0	ppb	Less than 1

Key Measurements



Proactive Indicator

[redacted] LN MRU Proactive KPI

Done

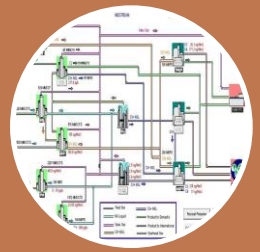
Local intranet | Protected Mode: On

100%

The Dashboard

Full Awareness Mode

Capturing the experience



Providing real-time measures

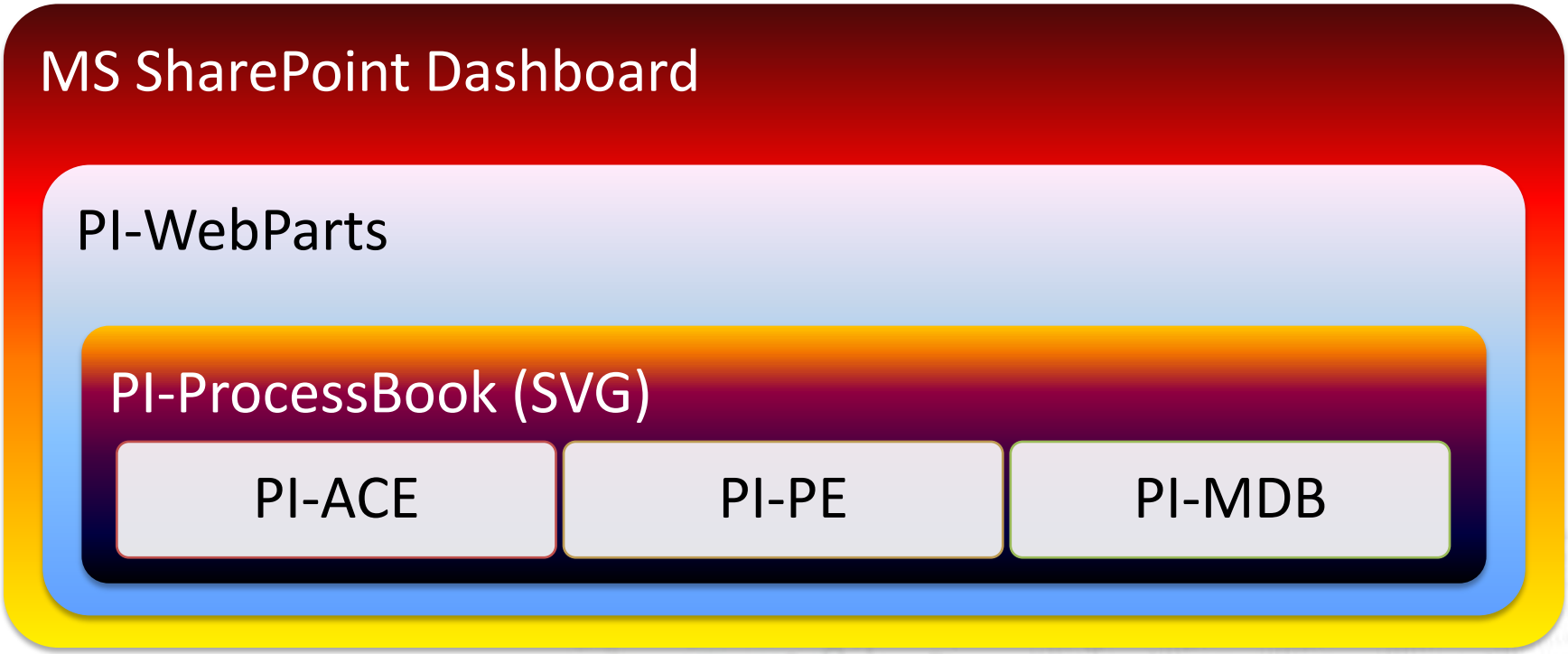
Identifying key items for current & historical analysis

Providing Advisory messages

Establishing Proactive Dashboards

Creating the Knowledge

Solution's Components



The Way Forward

- Develop a mechanism to deploy it at each site
- Refine the implementation procedures
- Utilize it for analyzing and monitoring chronic problems
- Migrate to PI-AF and PI-Notifications
- Introduce automated reporting mechanism to warn for major deviations in performance

Summary of benefits

- Complete monitoring and management pro-active tools
- Possibility to add any new units with minimal modifications
- Impact on performance improvement means multiple millions of dollars in additional revenues
- Solution's template could be used for other functionalities/applications
- The integration/utilization of OSIsoft tools removed layers of complications
- No additional investment is required

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References & Acknowledgments

- References
  - *"Delivering Asset Reliability"*, P. McNeil and H. Howland, Pipeline and Gas technology, May 2009
  - *"Developing Process Safety Performance Indicators"*, Peter Dawson, HSE, OGP Asset Integrity PKI workshop
  - *"Leading Performance Indicators: Guidance for Effective Use"*, Step Change In Safety
  - *"The five traps of performance measurements"*, Andrew Likierman, Harvard Business Review Oct 2009 p.96-101
  - *"The six mistakes executives make in risk management"*, N. Talib, D. Goldstein, and M. Spitznagel, Harvard Business Review Oct 2009 p.78-81

- Acknowledgments
  - Mercury use case team for the dashboard example
  - Burri Gas Plan SaS implantation team for the concept/chart of predicting failure
  - Engineering Solutions Center team for providing data access and infrastructure tools

Thank you